

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
<i>Fixed Wireless Communications Coalition, Inc.,</i>)	<i>RM No. 11778</i>
<i>Request for Modified Coordination Procedures</i>)	
<i>in Bands Shared Between the Fixed Service and</i>)	
<i>the Fixed Satellite Service</i>)	
)	

**COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
AND PUBLIC KNOWLEDGE**

New America’s Open Technology Institute and Public Knowledge (“OTI & PK”) submit these Comments in response to the Commission’s *Public Notice* on December 9 seeking comment on the Petition for Rulemaking filed by the Fixed Wireless Communications Coalition (FWCC) in relation to expanding shared access to several underutilized bands shared on a co-primary basis between Fixed Service (FS) and Fixed Satellite Service (FSS) licensees.¹ OTI & PK support FWCC’s proposal to open a rulemaking, particularly with respect to C-Band spectrum at 3700 - 4200 MHz and 5925 – 6425 MHz. We do not, however, support the specific rule changes proposed by FWCC and urge the Commission to consider alternative approaches that could facilitate more efficient and intensive use of these bands while protecting incumbent operations from harmful interference.

I. INTRODUCTION AND SUMMARY

As consumer advocates, our groups believe that the public interest goals of promoting innovation, market entry, competition, intensive spectrum re-use, and diverse uses and users are

¹ Fixed Wireless Communications Coalition, Inc., Petition for Rulemaking, RM No. 11778, Request for Modified Coordination Procedures in Bands Shared Between the Fixed Service and the Fixed Satellite Service Petition for Rulemaking (filed October 11, 2016) (hereinafter “*FWCC Petition*”).

best served by expanding shared access to very underutilized spectrum bands for both licensed and unlicensed use. The FWCC correctly states at the outset of its Petition that “[l]arge amounts of spectrum shared by the Fixed Service (FS) and the Fixed Satellite Service (FSS) go needlessly unused” and that full-band, full-arc coordination by FSS “violates core principles of spectrum management and policies against warehousing.”² Given the surging demand for both mobile and fixed wireless bandwidth, the importance of higher-bandwidth and more affordable connectivity to the economy, and new technologies and coordination mechanisms able to facilitate more intensive band-sharing, it should be intolerable to leave spectrum as potentially useful as the 3700 – 4200 MHz and 5925 – 6425 MHz bands largely fallow in most places and at most times.

OTI & PK strongly support the FWCC’s proposal to open a rulemaking to consider how best to expand shared access and productive use of these grossly underutilized bands. Our groups do not, however, endorse the specific rule changes proposed by FWCC, at least not as they would apply to the 3700 – 4200 MHz and 5925 – 6425 MHz bands. While FWCC is no doubt attempting to facilitate an incremental increase access to the spectrum lying fallow in those bands for certain specific Fixed Service uses (e.g., long-haul point-to-point links), the association’s proposal does not appear likely to achieve the far greater degree of spectrum usage, flexibility and efficiency that could be authorized using mechanisms such as an extension of the geolocation database framework governing the new Citizens Broadband Radio Service on the band immediately below the 3700 – 4200 MHz band – or, similarly, the wide-channel and low-power unlicensed use of the 5 GHz band immediately below the 5925 – 6425 MHz band.

OTI & PK urge the Commission to commence a rulemaking with a goal of expanding shared access to the bands identified by the FWCC – but, importantly, a proceeding that does not presuppose the particular access framework or rules that will be needed to ensure that FSS

² *FWCC Petition* at 1-2.

incumbents are protected from harmful interference. Even assuming that the Part 101 rules are appropriate to govern shared terrestrial access to the 3700 – 4200 MHz band going forward, the rules need to be modernized in a number of ways that are not anticipated by the FWCC’s overly-narrow petition. For example, OTI & PK recommend that the Commission, in its NPRM, propose or at least seek comment on how best to update the FCC database of FSS licensees and how best to automate the coordination between FSS incumbents and fixed wireless users. In short, OTI & PK support the petition’s proposal to open a rulemaking to expand shared access to these grossly underutilized bands, but we do not support the specific rule changes proposed by FWCC.

II. THE 50-YEAR-OLD PRACTICE OF FULL-BAND, FULL-ARC RESERVATIONS FOR FSS OPERATORS NEEDLESSLY LEAVES VALUABLE SPECTRUM FALLOW, VIOLATING MODERN PRINCIPLES OF SPECTRUM MANAGEMENT

OTI & PK commend the FWCC for proposing a modernization of the shared access rules governing the FS and FSS bands at issue here. We strongly concur with the FWCC that “[l]arge amounts of spectrum shared by the Fixed Service (FS) and the Fixed Satellite Service (FSS) go needlessly unused,”³ and that full-band, full-arc coordination “violates core principles of spectrum management and policies against [spectrum] warehousing.”⁴ Given the surging demand for both mobile and fixed wireless bandwidth, the importance of higher-bandwidth and more affordable connectivity to the economy, and the emergence of new technologies and coordination mechanisms that can facilitate more intensive band-sharing, it should be intolerable to leave spectrum as potentially useful as the 3700 – 4200 MHz and 5925 – 6425 MHz bands largely fallow across most of the nation.

³ *Petition* at 1.

⁴ *Id.* at 2.

As the FWCC Petition explains, under current rules FSS licensees can reserve hundreds of megahertz of spectrum that cover geographic areas where their earth station antennas are typically locked onto a single satellite transponder, which is typical for facilities engaged in video distribution. And why not? Under command-and-control allocation policies that have remained essentially unchanged for a half-century, FSS operators receive as much spectrum as they wish to claim and warehouse, at no cost, and irrespective of whether they actually make use of it. FSS operators have no economic incentive to share spectrum, to use it efficiently, or even to inform the Commission if their licensed sites are no longer in use.

The C-Band remains a cautionary tale of the wasted spectrum capacity that can result from zero-cost command-and-control spectrum allocations that are overtaken by new and more efficient technologies. There are already a dwindling number of earth stations receiving video distribution by satellite on the 3700 – 4200 MHz band for the obvious reason that gigabit-fast fiber optic connections are gradually replacing the technology. As the Commission has reiterated time and again since its landmark Spectrum Policy Task Force Report, released in 2002, the agency today strives to transition “legacy command-and-control bands to more flexible rules” and diverse uses.⁵ The Task Force Report emphasized that even the exceptions made for public safety or other public interest allocations should be narrowly defined *“and the amount of spectrum . . . limited to that which ensures that those [compelling public interest] objectives are achieved.”*⁶ The Task Force Report went on to warn that because many spectrum users will claim their planned use deserves an “exemption from any reform of their service allocation rules,” it is “critical to distinguish between special

⁵ *Report of the Spectrum Policy Task Force*, ET Docket No. 02-135 (Nov. 2002), available at http://sites.nationalacademies.org/cs/groups/bpasite/documents/webpage/bpa_048826.pdf (“Task Force Report”).

⁶ *Id.* at 41. See also FCC, “Report of the Spectrum Efficiency Working Group,” Spectrum Policy Task Force (2002), at p. 34-36, available at https://transition.fcc.gov/sptf/files/SEWGFfinalReport_1.pdf.

interests and the public interest, establishing a high bar for any service to clear prior to receiving an exemption.”⁷

The Commission reiterated these principles in its 2010 National Broadband Plan and went further, stating that “flexibility in access to spectrum can be just as important” as flexibility in spectrum use, and should increasingly include “unlicensed uses, shared uses and opportunistic uses.”⁸ The Plan further concludes that “the failure to revisit historical allocations can leave spectrum handcuffed to particular use cases and outmoded services, and less valuable and less transferable to innovators who seek to use it for new services.”⁹

Even the FWCC’s suggestion that FSS operators should be allowed to reserve a lesser amount of spectrum for “growth capacity” is contrary to evolving principles of dynamic and efficient spectrum assignments and sharing. In an early, influential critique of command-and-control allocations, former FCC Chief Economist Greg Rosston warned the Commission “should also be wary of unnecessarily reserving spectrum for future use.”¹⁰ As the evolution of C-Band use in the U.S. suggests, preempting the use of the 3700 – 4200 MHz band for more affordable point-to-multipoint links for gigabit home and business broadband connections – or preempting the use of the 5925 – 6425 MHz band for gigabit Wi-Fi or other small cell mobile device offload – based on a hypothetical future need of a fading technology, would needlessly sacrifice extremely valuable uses of these bands for affordable Internet access.

The FWCC’s proposal to open the specified FSS bands for more intensive sharing is also reinforced by the recommendations of the President’s Council of Advisors on Science and

⁷ *Id.*

⁸ Federal Communications Commission, “Chapter 5: Spectrum,” *National Broadband Plan: Connecting America*, at 75 (2010), available at <http://download.broadband.gov/plan/national-broadband-plan.pdf>.

⁹ *Id.*

¹⁰ Gregory L. Rosston and Jeffrey S. Steinberg, “Using Market-Based Spectrum Policy to Promote the Public Interest,” *Fed. Comm. L.J.*: Vol. 50: Iss. 1, Article 4 (1997), available at <http://www.repository.law.indiana.edu/fclj/vol50/iss1/4>, at p. 94; see also Covington & Burling Report, *supra* note 156, at p. 1.

Technology (PCAST). In its 2012 report, the PCAST focused on the spectrum efficiency and feasibility of sharing underutilized bands where the military, the FAA, DOT and other agencies needed to continue operating, but where they could do so in a manner that facilitates – rather than prohibits – access and dynamic sharing by other private sector users on a licensed or unlicensed basis, or both. “The essential element of [the] new Federal spectrum architecture is that the norm for spectrum use should be sharing, not exclusivity.” the PCAST recommended.¹¹

The PCAST’s report outlined a multi-tiered sharing approach, governed by an automated geolocation database, which the FCC quickly adapted to open the naval radar band at 3.5 GHz for a hybrid licensed and (effectively) unlicensed Citizens Broadband Radio Service.¹² The NTIA has also embraced this new band-sharing paradigm, stating early in 2015: “The future lies in sharing spectrum – across government agencies and commercial services, and across time, geography and other dimensions in the future.”¹³ In short, if dynamic spectrum sharing of underutilized spectrum at 3550 – 3700 MHz is workable for the Department of Defense and Navy radar on battle cruisers, it ought to be workable for FSS operators with fixed stations on the adjacent 3700 – 4200 MHz band, as well as in the uplink portion of the band at 5925 – 6425 MHz.

¹¹ President’s Council of Advisors on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, Report to the President (Jul. 2012) (“PCAST Report”).

¹² See Federal Communications Commission, *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, GN Docket No. 12-354, 30 FCC Rcd 3959 (rel. Apr. 21, 2015).

¹³ NTIA, “Promoting Spectrum Sharing in a Wireless Broadband World,” NTIA Blog (Jan. 9, 2015), available at <http://www.ntia.doc.gov/blog/2015/promoting-spectrum-sharing-wireless-broadband-era>.

III. THE COMMISSION SHOULD SOLICIT COMMENT ON ALTERNATIVE APPROACHES, MODERNIZE PART 101 TO FACILITATE INTENSIVE BAND SHARING, AND PERMIT FSS LICENSEES TO RESERVE SPECTRUM ONLY FOR ACTUAL USE

OTI & PK strongly support the FWCC’s proposal to open a rulemaking to consider how best to expand shared access and productive use of these grossly underutilized bands. Our groups do not, however, endorse the specific rule changes proposed by FWCC, at least not as they would apply to the 3700 – 4200 MHz and 5925 – 6425 MHz bands. While the FWCC is no doubt attempting to facilitate an incremental increase access to the spectrum lying fallow in those bands for certain specific Fixed Service uses (e.g., long-haul point-to-point links), the association’s proposal does not appear likely to achieve the far greater degree of spectrum usage, flexibility and efficiency that could be authorized using mechanisms such as an extension of the geolocation database framework governing the new Citizens Broadband Radio Service on the band immediately below the 3700 – 4200 MHz band – or, similarly, the wide-channel and low-power unlicensed use of the 5 GHz band immediately below the 5925 – 6425 MHz band.

FWCC proposes that FSS operators should have exclusive access only to “the specific combinations of frequency, azimuth, and elevation angle it intends to use,” and that if a reported combination goes unused for more than 90 days, it “must be reported and deleted from the license.”¹⁴ In addition, FWCC proposes that FSS operators can reserve additional combinations as “growth capacity,” which it deems “analogous to the growth channels permitted to parties coordinating FS facilities.”¹⁵ Although some allowance for “growth capacity” may be justifiable, the Commission must also recognize the moral hazard inherent in giving any operator the ability to warehouse spectrum for an indefinite period. At a minimum, the Commission should consider mechanisms – including the option proposed by FWCC – to ensure that even if an incumbent is

¹⁴ FWCC Petition at 8.

¹⁵ *Id.*

prioritized for “growth capacity,” that competing uses can gain access if that spectrum is not in use and is the only suitable spectrum at a location. Ultimately, actual use in the public interest is the only justification for a reservation of cost-free spectrum by either FS or FSS licensees.

More generally, while the FWCC has proposed a particular set of rule changes aimed at facilitating a specific fixed wireless use case, the Commission should seek comment on alternatives that can achieve more widespread and intensive sharing of these bands, including by low-power fixed wireless and terrestrial mobile users that could operate without causing harmful interference to incumbent FS or FSS licensees. Indeed, as the Petition acknowledges, the Commission itself proposed an alternative solution in a NPRM in 2000 that was not adopted due to lack of support from either industry.¹⁶ Here the FWCC has requested rule changes for four different bands, each of which should be considered separately in a future NPRM with respect to the optimal way to facilitate more intensive use of the spectrum in the public interest.

OTI & PK recommend that the Commission commence a rulemaking that examines each band separately, including a modernization of the Part 101 rules and whether unlicensed access under Part 15 is appropriate, particularly in the uplink C-Band (5925 – 6425 MHz) that is immediately adjacent to the U-NII-3 and proposed U-NII-4 unlicensed bands. In recent years, as the demand for wireless bandwidth has exploded, it has become clear that the efficient re-use of spectrum inherent in low-power, small cell deployments should be encouraged where possible.

With respect to the Part 101 rules governing access to 3700 – 4200 MHz band for fixed wireless services, the time is ripe for the Commission to reconsider entirely how best to enable intensive terrestrial use of vacant spectrum to promote the nation’s affordable broadband goals. Although high-power, point-to-point links clearly serve useful purposes, recent technical developments suggest that the 3700 – 4200 MHz band could potentially substitute for trenching

¹⁶ FWCC Petition at 10.

wireline fiber to many homes and businesses over the final 300 to 1,000 feet or further, re-using the spectrum at low-power while greatly reducing the cost of gigabit broadband connectivity, particularly in small towns, exurbs and rural areas. Although companies including Starry, OneWeb and Verizon are using (or preparing to use) millimeter wave bands as a fiber substitute, the largely unused spectrum across most of the 3 GHz band could provide wide channels, better propagation, lower costs and open access for competition if spectrum policy allows for it. For the foreseeable future, as Verizon acknowledges, high-capacity “5G” connectivity will be depend on fixed wireless, point-to-multipoint links at relatively low power that would be far more effectively deployed at frequencies below 6 GHz.

One example of the potential benefits of relatively low-power fixed wireless as a substitute for trenching is the innovative Terragraph point-to-multipoint network topology that is being piloted by Facebook in San Jose, California.¹⁷ The Terragraph network relies on unlicensed 60 GHz spectrum and WiGig, a very high-capacity enhancement of the Wi-Fi standard. Because of very limited propagation at 60 GHz, nodes are placed at roughly 200 meter intervals and use beam-steering antennas and a cloud-based controller to route traffic and minimize interference.¹⁸ It is not difficult to imagine ISPs deploying similar fixed wireless architectures on unused C-Band spectrum at lower cost, or with higher quality of service, by taking advantage of the vastly better propagation characteristics of mid-band spectrum below 6.5 GHz.

Another example is Mimosa, a Silicon Valley start-up that uses unlicensed 5 GHz spectrum, quad-sector antennas and massive MIMO technology to deliver high-capacity

¹⁷ Caitlin McGarry, “Facebook’s Terragraph Aims to Replace Fiber with Fast, Low-Cost Wi-Fi,” *PCWorld* (April 13, 2016), available at <https://goo.gl/9JSk1x>; Russell Brandom, “Facebook’s New Gigabit Wi-Fi System is Coming to San Jose,” *The Verge* (April 13, 2016), available at <https://goo.gl/IWVxK8>.

¹⁸ Neeraj Chouby and Ali Yazdan Panah, “Introducing Facebook’s New Terrestrial Connectivity System,” Facebook Blog, available at <https://goo.gl/yTU1dX>.

multipoint broadband links that substitute for fiber at distances up to 500 meters.¹⁹ Like Terragraph, a critical ingredient for Mimosa’s access points as low-cost substitutes for trenching fiber is the ability to transmit point-to-multipoint. However, because the Commission’s 5 GHz proceeding remains unfinished, the promise of multiple 160 MHz-wide channels needed for gigabit Wi-Fi remains unfulfilled. Extending the proposed U-NII-4 band above 5925, into the grossly underutilized 5925 – 6425 MHz band, could greatly boost ‘wireless fiber’ deployments by Wireless Internet Service Providers (WISPs) and fuel the ability of mobile devices to more easily offload rising data demand in congested areas as next generation gigabit Wi-Fi chips – based on the 802.11ax standard for 5 GHz – find their way into consumer handsets.

Realizing the enormous potential of the 3700 – 4200 MHz and 5925 – 6425 MHz bands will require a broader rulemaking. FWCC is clearly correct that the practice of full-band, full-arc licensing leads to an over-inclusive (and indefensible) warehousing of valuable spectrum capacity. However, even assuming that the Part 101 rules are appropriate to govern shared terrestrial access to the 3700 – 4200 MHz band going forward, the rules need to be modernized in a number of ways not anticipated by the FWCC’s overly-narrow petition. OTI & PK recommend that the Commission, in its NPRM, propose or at least seek comment on how best to automate the coordination between FSS incumbents and fixed wireless users. For example, the Commission should consider an approach similar to Section 96.17(d), adopted to protect FSS in the 3.5 GHz CBRS Order, which requires earth station licensees requesting interference protection to annually register their technical parameters with the Commission. With multiple FCC-certified Spectrum Access Systems coming online for the purpose, in part, of managing protection zones to protect FSS earth stations above 3600 MHz from harmful interference, the

¹⁹ Monica Allevan, “Mimosa Delivers Fixed Wireless MicroPop for Urban, Suburban Environments,” *Fierce Wireless* (July 11, 2016), available at <https://goo.gl/EFDRPs>.

Commission should explore the feasibility of extending the SAS geolocation database and governance mechanism to promote efficient sharing in at least the 3700 – 4200 MHz band. The clunky, manual coordination process described in the FWCC petition will never be able to accommodate the potential for hundreds of thousands of low-power, fixed wireless links that could and should be accommodated in the band. The Commission should also explicitly propose or seek comment on point-to-multipoint use of these bands, at least at low-power, and modify technical rules to accommodate modern fixed service uses, such as directional antennas, massive MIMO, location accuracy requirements and OOB limits.

IV. CONCLUSION

The Commission should grant the FWCC's Petition and issue a NPRM to facilitate more intensive and efficient sharing of the grossly-underutilized spectrum identified in the Petition by terrestrial broadband providers on both a licensed and unlicensed basis. OTI & PK do not, however, endorse the specific rule changes proposed by FWCC, at least not as it would apply to the 3700 – 4200 MHz and 5925 – 6425 MHz bands. A NPRM aimed at modernizing the Part 101 rules to allow for more intensive use of the 3700 – 4200 MHz and 5925 – 6425 MHz bands for shared use by a wide variety of users would clearly promote the public interest.

Respectfully Submitted,

**Open Technology Institute at New America
and Public Knowledge**

Harold Feld
John Gasparini
Phillip Berenbroick
Public Knowledge
1818 N Street, NW
Washington, DC 20036

/s/ Michael Calabrese
Michael Calabrese
Wireless Future Project/
Open Technology Institute at
New America
740 15th Street, N.W. – 9th Floor
Washington, DC 20005

January 9, 2017